REMARKS

The Office Action dated May 1, 2003 has been received and carefully noted. The above amendments and the following remarks are submitted as a full and complete response thereto. Accordingly, claims 1-20 are pending in this application and are submitted for consideration.

Applicant acknowledges and thanks the Examiner for indicating that claims 13-16 are allowed, and that claims 6, 7 and 20 would be allowable over the prior art if amended to be in independent form. However, Applicant respectfully submits that all of the presently pending claims recite allowable subject matter and therefore, placing claims 6, 7 and 20 into independent form is not necessary.

The specification was objected to for minor informalities. By this Amendment, the specification has been amended. Applicant requests that the objection be withdrawn.

Claims 1-5, 8-12 and 17-19 were rejected under 35 U.S.C. § 102(e) as being anticipated by Noel (U.S. Patent No. 6,360,587). However, Applicant respectfully submits that claims 1-5, 8-12 and 17-19 recite subject matter that is neither disclosed nor suggested in Noel.

In making this rejection, the Office Action took the position that Noel discloses all of the elements of the claimed invention. However, it is respectfully submitted that the prior art fails to disclose or suggest the structure of the claimed invention, and therefore, fails to provide the advantages of the present invention. For example, the system of the present invention is configured to include a processing delay circuit which inputs at least one of the discharge current and the ionization current and based on the inputted

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current, delays starting of the period by a time point which is not earlier than termination of the discharge current.

With this arrangement, since the engine misfire detection system according to the present invention is configured to delay the start of the integration period by a prescribed period (the masking period) from the start of the period of ionization current occurrence, waveforms during the time of inductive noise occurrence can be reliably masked and prevented from exerting any adverse effect. False misfire detection caused by such a waveform can therefore be prevented to enable still more accurate detection of misfire.

Claim 1 recites a system for detecting misfire for an internal combustion engine having an ignition plug. The ignition plug is installed to face into a combustion chamber of a cylinder of the engine and is connected to an ignition coil, which produces spark discharge when supplied with discharge current from the ignition coil to ignite air-fuel mixture in the combustion chamber. The system includes a current detection circuit which detects ionization current that flows following the discharge current during a period. A misfire detector detects the occurrence of misfire of the engine based on the detected current. A processing delay circuit inputs at least one of the discharge current and the ionization current and based on the inputted current, delays starting of the period by a time point which is not earlier than termination of the discharge current.

Claim 9 recites a system for detecting misfire for an internal combustion engine having an ignition plug. The ignition plug is installed to face into a combustion chamber of a cylinder of the engine and connected to an ignition coil which produces a discharge spark when supplied with discharge current from the ignition coil to ignite air-fuel

mixture in the combustion chamber. The system includes a current detection circuit which detects ionization current that flows following the discharge current during a period. A misfire detector detects the occurrence of misfire of the engine based on the detected current. A processing delay circuit which inputs at least one of the discharge current and the ionization current and based on the inputted current, delays starting of the period by a time after the ionization current begins to flow.

Claim 17 recites a method for detecting misfire for an internal combustion engine having an ignition plug. The plug is installed to face into a combustion chamber of a cylinder of the engine and connected to an ignition coil which produces spark discharge when supplied with discharge current from the ignition coil to ignite air-fuel mixture in the combustion chamber. The method includes the steps of: detecting ionization current, that flows following the discharge current, during a period; detecting occurrence of misfire of the engine based on the detected current; and inputting at least one of the discharge current and the ionization current and based on the inputted current, delays starting of the period by a time point which is not earlier than termination of the discharge current.

Noel discloses a pre-ignition detector. Ion sensing circuit 28 is configured to provide means for sensing the ion current I_{ION} and to generate an ion sense signal. The ion sense signal represents the ion current through the spark plug. As shown in Fig. 1, processing circuit 44 is responsive to ion sense signal V_{ION} for generating a pre-ignition signal. As shown in Fig. 2A, circuit 44 includes an inverter circuit 52, a comparator circuit 62, and a comparator 70. Circuit 52 inverts the raw ion signal V_{ION}. The inverted ion voltage signal is then compared to predetermined reference voltage V_{REF}.

Comparator 70 generates a digital output pulse indicative of pre-ignition combustion. When comparator 70 fails to generate a pulse, this indicates that a misfire has occurred. As shown in Fig. 2B, processing circuit 44 includes an integrator circuit 72. A charging current I proportional to the generated ion current I_{ION} is received through diode 78 and charges capacitor 76. Capacitor 76 operates to integrate the ion sense signal V_{ION}, which accumulates on capacitor 76 as V_{CAP}. The integrated signal is compared to a reference voltage V_{REF}.

Although Noel discloses that "[o]ther detection windows, such as a second detection window 82 shown in Fig. 3C may alternatively be employed," (see col. 6, lines 22-24), this merely indicates that, in order to detect pre-ignition, the window may be set at any time point before the spark occurs (e.g., col. 1, lines 59-63).

However, upon review of Noel, Applicant respectfully submits that Noel fails to disclose or suggest a system for detecting misfire having a processing delay circuit inputs at least one of the discharge current and the ionization current and based on the inputted current, delays starting of the period by a time point which is not earlier than termination of the discharge current, as recited in claim 1. Noel also fails to disclose or suggest a processing delay circuit which inputs at least one of the discharge current and the ionization current and based on the inputted current, delays starting of the period by a time after the ionization current begins to flow, as recited in claim 9. Noel further fails to disclose or suggest a method of detecting misfire including inputting at least one of the discharge current and the ionization current and based on the inputted current, delays starting of the period by a time point which is not earlier than termination of the discharge current, as recited in claim 17.

Therefore, it is respectfully submitted that the Applicant's invention, as set forth in claims 1, 9, 13 and 17, is not anticipated within the meaning of 35 U.S.C. § 102.

As claims 2, 5 and 8 depend from claim 1, claims 10-12 depend from claim 13, and claims 18 and 19 depend from claim 17, Applicant respectfully submits that each of these claims incorporate the patentable aspects thereof, and are therefore allowable for at least same reasons as discussed above.

In view of the foregoing, reconsideration of the application, withdrawal of the outstanding rejections, allowance of claims 1-20 and the prompt issuance of a Notice of Allowability are respectfully solicited.

If this application is not in condition for allowance, the Examiner is requested to contact the undersigned at the telephone listed below.

In the event this paper is not considered to be timely filed, the Applicant respectfully petitions for an appropriate extension of time. Any fees for such an extension, together with any additional fees that may be due with respect to this paper, may be charged to counsel's Deposit Account No. 01-2300, **referencing docket number 107101-00038.**

Respectfully submitted,

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